Jeff Hulen/PIX04133

The drilling of production wells, such as these at The Geysers (above) and Imperial Valley (opposite) in California, accounts for a third to a half of the cost of a geothermal project. About 10,000 people are directly employed in the geothermal electric industry.

Overview

Geothermal power is a commercially proven renewable resource. Geothermal generating capacity in the United States is currently about 2300 MW, distributed among baseload power plants located in four states — California, Nevada, Utah, and Hawaii. Geothermal energy accounts for around 2% of the country's renewable-source electric generating capacity.

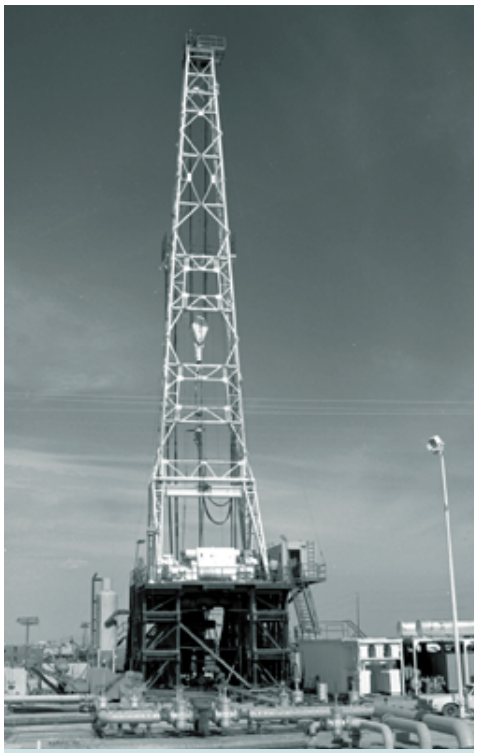
In 1996, the U.S. geothermal energy industry as a whole provided about 12,300 direct domestic jobs, and an additional 27,700 indirect domestic jobs. The electric generation part of the industry employed about 10,000 people to install and operate geothermal power plants in the United States and abroad, including power plant construction and related activities such as exploration and drilling; indirect employment was about 20,000.

Success Stories

Providing Jobs and Tax Revenue

Nevada's geothermal plants produce about 210 MW of electricity, saving energy imports equivalent to 800,000 tons of coal or three million barrels of oil each year. Although California has much greater installed capacity, Nevada, with just over a million residents, uses more geothermal energy *per capita* than anywhere else in the country.

Taxes received from geothermal operations are a significant source of revenue for Nevada's local and state governments. In 1993, Nevada's geothermal power plants paid $800,000 in county taxes and $1.7 million in property taxes. In addition, the U.S. Bureau of Land Management collects nearly $20 million each year in rent and royalties from geothermal plants



Warren Gretz, NREL/PIX0045

Geothermal production well at Imperial Valley, California.

producing power on federal lands in Nevada — half of these revenues are returned to the state.

"Net proceeds tax, property tax and county tax payables have increased for geothermal plants throughout the state, especially in rural areas."

— Thomas Flynn, University of Nevada (*Geo-Heat Center Bulletin*, May 1996)

The California Energy Company (CalEnergy) operates geothermal power plants in California, Nevada and Utah. In California, the company employs 226 people at its Salton Sea geothermal field in the Imperial Valley and 121 people at the Coso geothermal field. In 1995, CalEnergy contributed more than $45 million to California's tax base through income taxes, payroll taxes, local (county) taxes and unemployment taxes.

Most of the electricity produced from the Coso geothermal field comes from power plants located on U.S. Navy land near China Lake in Inyo County. Tax revenues paid to Inyo County by CalEnergy amount to more than 20% of the county's annual income. In addition, the Navy gets royalties and cheaper electricity from the plants; in one year alone (1993), the Navy saved $4.2 million in electricity costs, which equates to a one-third reduction in the total electricity bill for the China Lake Naval Air Weapons Station.

Displacing Imported Fuel Oil in Hawaii

Hawaii has no conventional energy resources and is forced to import virtually all of its energy, including every drop of oil. Fully 85% of the state's electricity is generated from petroleum products, primarily fuel oil, compared with only 3% for the United States as a whole. Importing oil represents a significant drain on the state's economy, and creates a strong incentive to develop domestically available renewable energy resources.

Geothermal energy has been identified as perhaps the best near-term indigenous resource to meet the energy needs of the "big island" of Hawaii. A single 25-MW geothermal plant on the island produces 19% of the baseload needs of the Hawaiian Electric Light Company, replacing 1000 barrels of imported fuel oil per day.

"The [Salton Sea Geothermal] Project will provide economic benefits to the State of California in the form of additional jobs and an expanded tax base."

— David Sokol, CalEnergy chairman (CalEnergy press release, April 1995)

How It Works

Geothermal ("Earth-heat") energy comes from the residual heat from the Earth's formation and from the radioactive decay of atoms deep inside the Earth. This heat is brought up to the Earth's crust by molten rock (magma) and by conduction through solid rock. There it raises the temperature of groundwater trapped in the fissures and pores of underground rock, forming zones called hydrothermal reservoirs. Geothermal power plants are driven by hot water and steam produced from wells drilled into these hydrothermal resources.

In most geothermal power plants, the steam from hydrothermal reservoirs is used to generate electricity by spinning a turbine generator directly; in others, the geothermal hot water is used to vaporize a working fluid that boils at a low temperature. This vapor is then piped to a turbine to generate electricity.

Potential geothermal energy reserves are so large that they are considered inexhaustible. Nevertheless, the fluid in individual hydrothermal reservoirs can be depleted to the point where the reservoir becomes economically unproductive. For this reason, sustainable use of specific hydrothermal resources always requires the reinjection of water into the underground reservoir to maintain pressure. Injection of fluids from the Earth's surface can also help to increase output from reservoirs after they have become depleted, a strategy that is being pursued at The Geysers field in California.